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ABSTRACT

Reuther High School has been an alternative school in the Kenosha, Wisconsin, school district for many years. In 1998, PLATO Learning, Inc. made it possible for Reuther to offer consistent skill development on a flexible schedule through computer assisted instruction. PLATO systems have been made part of five credit completion programs. An evaluation was conducted of PLATO's use at this high school. Students in Reuther PLATO programs must complete all parts of PLATO modules with 80% accuracy on drills and two tries on mastery tests. Reuther students scored at the 48th percentile on the Iowa Tests of Educational Development (ITED) before taking PLATO and at the 57th percentile afterward. This increase was small to moderate, but it is potentially educationally meaningful. The number of modules mastered by students was positively correlated with posttest scores, indicating that students learned from the modules. ITED scores increased 1 percentage point for each 15 or 16 PLATO modules mastered. Students with low entry skills benefited as much from PLATO instruction as those with higher entry skills. All five participating teachers responded to surveys, and four were interviewed. Teachers were happy with PLATO and liked the flexibility PLATO gave them in helping high-need students to succeed. (Contains 16 figures.) (SLD)

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Evaluation Series

Skill Development PLATO Use at Reuther Alternative High School Kenosha, Wisconsin

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Executive Summary

Reuther High School has served Kenosha District for many years as an alternative school. Since fall of 1998, PLATO has made it possible for Reuther to offer consistent skill development on a flexible schedule, and has been part of five credit completion programs. In those first three years, PLATO has met the learning needs of many at-risk students who could not have succeeded as well, if at all, in a standard high school setting.

Reuther programs are distinguished by their requirements for PLATO use. Students must complete all parts of PLATO modules, with 80% accuracy on drills and two tries on mastery tests. Accelerated Independent Study (AIS), the highest enrollment specialty program, offers the most instructional time and requires attendance, which results in more time-on-task for PLATO work.

Data Analysis. Students were included in this study in three categories, according to the information that was available regarding them: (1) those with standardized pretests and posttests (test-only students); (2) those with PLATO use data (use-only students); and (3) those with both test and PLATO use data (test-and-use students).

Reuther students scored at the 48th percentile on the Iowa Test of Educational Development (ITED) before taking PLATO and at the 57th percent after completing the program. While this 9 percentage point gain is small to moderate in size it is potentially educationally meaningful.[1] When the gains on the eleven ITED sub-test scores were examined, statistically significant gains were found for all eleven measures. Large gains were achieved for Sources of Information (15%), Quantitative Thinking Total and Advanced (15% and 14% respectively), and Science (10%). The range of effect size gain scores in standard deviations is from 0.26 to 0.79, ranging from small to fairly large gains

The number of modules mastered by students was positively correlated with posttest scores, indicating that students learned from the modules. ITED scores increased one percentage point for each 15 or 16 PLATO modules mastered. Students with low entry skills benefited as much from PLATO instruction as those with higher entry skills—they started and ended in a different place, but they traveled the same distance. Mastering PLATO modules benefits both lower and higher entry-skilled students.

All five AIS teachers responded to surveys; four were interviewed. Respondents were happy with PLATO; they particularly liked the flexibility that PLATO gave them in helping high-need students to succeed. Most said PLATO was useful and that it aligned with their own objectives and the final test. They could all do tutoring while students were engaged, and yet they were divided about ease-of-use for students. English teachers were happier with PLATO than were teachers of other subjects. Social studies received bad marks, and there was a mention of errors in the math program; one teacher was very happy with the new science. Four teachers were happy with their training; the late-starter did not receive formal training and would like some. Reuther teachers do not print

[1] Graduates of the program averaged in the 60th %ile, showing a 10% gain.—*ed.*

student use reports, but they might like both online and paper reports that are easy to print and concise. The school could also use a more basic program for low skills, including a headphone option.

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Reuther Alternative High School
Kenosha, Wisconsin

Introduction

Reuther High School has been an alternative school for many years, helping students graduate by offering unique programs. PLATO was added in early 1998 by Principal Dan Tenuta, after he compared it to NovaNet. PLATO was to be used at three high schools in Kenosha District, but Reuther High School was the only location that intended to employ it as the primary source of instruction.

When the plans for Reuther's use of PLATO became public, concern—if not opposition—was expressed by some citizens and district personnel who questioned whether a computer-based curriculum would be adequate and student learning would be genuine. To dispel fears, school board members and the community were invited to visit the school. When they did come, approximately 30 of them over the three years, they were invited to do a lesson on PLATO in their favorite content area and try the instruction for themselves. In addition, they were assured that Reuther students were required to produce at least one professional-looking report for each half-credit or credit and, for some credits, to read books. Since the first year there has been no serious complaint about the program. In fact, Reuther's success has been outstanding.

Program Description

As of the 2000-2001 school year—the third year of PLATO use—Reuther houses seven alternative credit programs, most of which use PLATO to some degree. These programs are listed here, along with a brief description of the target students and the amount of time for which PLATO is used. The Accelerated Independent Study (AIS) program was chosen for this Plato study because it has the greatest use of Plato, highest student enrollment, and best student attendance.

Accelerated Independent Study (AIS)—Alternative program held for three hours a day, five days a week (15 hrs.), with three time options: morning, noon, and night. It offers classes on PLATO exclusively; a book report or other written report is also required. Students apply for and attend the program on a quarter-by-quarter basis and during the summer. At least 90% attendance is required, and those who do not comply, or make up lost time for two weeks, are moved to the "Transition" program. (AIS is the only program at Reuther that requires attendance.)

Part-Time AIS—Offers PLATO courses for students all over the district who need to catch up just one or two credits. Classes meet for 90 minutes; the design calls for 30 minutes PLATO, 30 minutes group work, and 30 minutes of individual reading, but the actual distribution of time varies from day to day.

Transition—Program for students who did not attend the AIS program as required. Class time is eight hours a week—two hours a day, four days a week (8 hrs.)

KAPPS—Program for single mothers, who typically have low skill levels. Classes are done like the AIS program, but there are no consequences for poor attendance.

SAPAR—Program for pregnant students, handled the same as KAPPS.

Credit Completion—For students who need just one or two credits in order to graduate. Classes are 75 to 90 minutes a day; students come after school in the afternoon. The staff works to provide whatever course a student needs in order to graduate.

Accelerated Literacy—Basic program for those who have very low reading and math skills. The class meets for three hours; PLATO was not used last year.

Program Design for Accelerated Independent Study (AIS). The Accelerated Independent Study (AIS) program was started in the fall of 1998 (three years prior to this study) as a way for at-risk students graduate from high school by gaining credits on a flexible schedule. In addition, ambitious students could take AIS classes and change poor grades they had received in earlier semesters in other schools. At this writing, a few students have participated in the AIS program so that they could finish high school while attending college classes, an approach encouraged by the district's willingness to pay for the college tuition in that circumstance. Once AIS students have completed the necessary credits, they receive a regular diploma, albeit with a computer notation added at the bottom.

High school students from throughout the district may apply to participate in the AIS program. Their qualifications determine their approval, not their reasons for applying. Students must be 16 in order to participate in the program, but most of them are 17 and some are even 19 or 20. Whatever their age, applicants are usually freshmen or sophomores when they apply. Applicants are interviewed by AIS staff in order to ascertain whether they have the necessary commitment to attend regularly and work independently. At that time, staff also explain to applicants that they must have 90% attendance or they will be dropped so that others can participate. In addition to the interview, AIS staff review grades and standardized test scores to determine whether students have the entry skills necessary to succeed in the computer courses. "Such information does not exclude students," says Charlotte Calhoun, "but it is used to select students who lack literacy and numeric skills necessary [to participate]." Students who are skill-deficient are put into the "Accelerated Literacy" program.

Once accepted into Accelerated Independent Study, learners are enrolled according to their needs, quarter by quarter, through the school year and for one six-week session of summer school. Students take one PLATO block of three options available: morning (8:30-11:30 a.m., M-F); afternoon (12:00-3:00 p.m., M-F); and evening (4:45-8:30 p.m., M-Th). The total time per week for all three time slots is 900 minutes. (During the summer there is no afternoon session.) Students can put in extra time if they choose to do

so and are encouraged to progress at their own speed; if they can pass a mastery test they are told to go on to the next module. One hundred students are placed in the PLATO program each quarter; of these, approximately 20% complete their requirements each quarter.

Attendance is a major criterion for student participation in AIS. For the past three years, if they did not attend 90% of the required time by Friday of each week, they were given until the following Friday to do so. If they did not attend for the requisite number of minutes by the second week, they were transferred to the Transitional Program, which only required eight hours a week. Designed to be a less desirable situation, especially in light of the small attendance requirement, transition students were given a packet of worksheets and told to complete the papers during their eight hours. At the beginning of the following quarter, students started on the computers where they left off. Beginning Fall 2001, AIS students will be given an entire quarter to garner 90% of their attendance time, and if they cannot complete their time they will be given one more quarter to try the PLATO alternative before being dropped from the AIS program. This change was made to accommodate students who have illness or other problems and cannot perform for periods of time.

Besides the PLATO course work, students are required to read, write papers, or do projects for each course credit. While these projects are not graded, they are nevertheless required and valued as hands-on experience and a break from the computer for students who need to change activities often. All papers must be word-processed; teachers show students the district criteria for papers and coach them on what they need to do for research and for writing reports, such as margins, pagination, and headings. The resulting products are evidence of student learning. In the process of learning and production, students are also required to treat the equipment well and to do their own work. Misuse of equipment and blatant plagiarism are grounds for expulsion from the program.

The School. Reuther High School is housed on the first two floors of an old—and well kept—square, brick building in the southern, older area of Kenosha. (The third floor houses the high school military program.) Students come and go from the building all day and evening, depending upon the program in which they are enrolled. (Some students attend only their alternative program and perhaps have a job; others are concurrently enrolled in another high school or a local college program.) Counselors are available to talk with students who are interested in Reuther's various programs or to give them special guidance. The principal, Dan Tenuta, and his office staff provide support for teachers and students.

The Students. Most students in the program, especially at its beginning, have been credit-deficient and looking for a way to graduate. Some students lack only one semester of work in order to graduate, but many are very skill- and credit-deficient. The teen mothers were reported to be very credit-deficient and skill-deficient, as a group.

Reuther teachers report that most of their credit-deficient students could be termed "at risk" because of their many problems and challenges. These students are likely to be holding down jobs in order to buy food and clothing and other basic necessities that are not provided by parents. Some students use illicit drugs or alcohol; some have problems with mental health and medications. It is common for Reuther students to miss school or have concentration and performance problems because of these situations; for instance, some students miss several days of school with an easily managed illness because they have not been taken to a doctor. One teacher lamented, "These are kids who can't function in the high school...In general, these students do not like listening to adults, so the PLATO program is very good for them."

Over the three years of the program, however, better students have begun to apply, those who are there strictly for the acceleration possibility. These students are finishing school early or are doing dual-enrollment in a local college, a plan that has been encouraged by the new district policy to pay college tuition for students who are enrolled in high school. One such student completed a cosmetology certificate and another gained a certified nurse assistant (CNA) certificate at the local technical college.

Most AIS students learn keyboarding after starting the program. One teacher explained, "They don't come in knowing how to type. They memorize the screen and type in sentences."

Use of PLATO

Technology. Historically, computers have been used at Reuther for ten or more years. In the beginning only a few teachers, such as those teaching social studies or science, had one or two computers for classroom use. Eventually, all teachers were given a computer for personal uses such as student record keeping, and computer labs were added in which students used primarily CCC software and keyboarding programs.

Reuther now has four computer labs with PLATO available. Each lab has approximately 16 computers, most of which are Omni Tech brand with 14 inch monitors. PLATO computers are networked, with the server being located in the school library. (A new server was provided in June of 2001 after a week of problems because the old server could not handle new PLATO software.) In each Plato lab there are usually two educators who can answer content questions, help students learn to use the PLATO system, take attendance, and advise students on their project work.

The Staff and Their Computer Experience. School and PLATO staffs agree that PLATO teachers are professional and hard-working. AIS teachers like the PLATO system and they like working with their special-needs students. In fact, teachers are carefully selected to work at Reuther, and are chosen for teaching competence, computer experience, and most of all, warm and helpful personalities. All of these qualities are needed by students who struggle with learning.

Charlotte Calhoun and an at-risk school counselor interview students and decide who will be admitted to the AIS program; she also teaches English. "I taught Spanish [many years] and did not use computers. I wanted to change [my teaching assignment] because I did not like the 90 minute block for language instruction, especially if classes were not held daily."

Liz Whitlock keeps statistics of the program—records of student standardized tests, PLATO work, and attendance—and teaches math and statistics. She has used computers in education since the 1980's.

John Lovell teaches political science and social studies. Regarding his computer experience he says, "I have used them seven or eight years—all of my teaching years. I was the first to get Internet in the building; I want a PowerPoint projector badly.

Marie Lipke teaches English, art, and music. Marie says of her computer experience: "I have had a computer in my classroom for about five years, to help kids with research on the Internet or for students to use in writing papers. I developed "Research for Artists"—a web site; it could use more work but I did start it." She has taken several technology classes, including one on the Internet. She uses MACs and Corel.

Sandra Armstrong's computer experience began with the AIS program three years ago.

Lee Doherty has been a teacher during the summers.

The Staff and Their PLATO Experience. Charlotte, Liz, Sandra, and John were trained at the beginning of the AIS program, for two days before school started. Training was a good experience for all of them. John added to his comments, "Steve Levy walked us through the process. That was good."

Marie has been involved for two years. She explains: "I came out to visit Charlotte and saw what she was doing. I have spent 31 years teaching high school, and this is a very exciting way to learn." Since Marie came into the program at a different time, she has not had the same training as the others. "The first year I taught after school for the extended day class with Charlotte; this year I taught full time with Liz...The learning curve involved in AIS, not just PLATO, is very long. You have to learn Grade Book Plus, take attendance. A good mentor is important; I consider myself lucky because I have had Charlotte and Liz to teach me. The kids are not a problem." She went on to explain that she has learned a little about student PLATO records, even though teachers do not print them: "I go ask somebody to help me usually. I can put people into the system; the district did a workshop last winter at another high school and I learned it there. It was useful."

Student Placement in PLATO. Students entering the AIS program are given the Iowa Test of Educational Development (ITED) Form K as a pre-assessment to determine their greatest needs and to confirm that they have the skills necessary for using PLATO successfully. At the end of a PLATO course, students are given the ITED again (usually

Form M) for their course content, and the final score determines their course grade. The ITED exams are administered at the school and scored at central office. During the school year, students are tested at the same time on certain dates. During summer school, there are no pretests, as such, and posttests are given as needed. Whatever the time of year, teachers support testing. "We set up a testing area for students that has light and ventilation, etc. It is a good testing environment."

Based upon ITED pretests, or other tests or computer work, students in the Accelerated Independent Study program who are found to be seriously skill-deficient are put into the "Accelerated Literacy" program and given daily three-hour tutoring sessions in reading and math by selected teachers who use their own best-practice strategies. The goal is to bring up their reading levels so that they can use PLATO.

Students who have attained at least minimum scores on ITED testing are thereafter given PLATO assessment tests, which have been assembled based upon local and state standards. Charlotte complimented PLATO for their help in setting up assessments. "PLATO's response to problems is quick and helpful…They were willing to align the program with our district and state standards. Now I do not worry about that—I don't have time…The PLATO assessment test helped more [than the ITED to understand what students have needed and plan curriculum.]" The PLATO assessments are used to determine which modules students are required to do. "The way the courseware worked determined how the program was organized. All students do the English and Math Fundamentals and then they do GED prep."

Listed below are the courses that are offered in the AIS program and the parts of PLATO that are used.

English—First part, up to 2 credits, based on deficiencies in the student's credit history. "We always start with English and then the reading level has improved a lot by the time they are ready to go on. We do not do assign the reading test; if they are at the fourth stanine or lower they are sent to the Accelerated Literacy class."
PLATO Component/Other Course Materials:

- PLATO English Fundamentals with Assessments—Required[2]
- PLATO Writing Skills—GED Prep[3]
- Library Books—One for every half credit, 180 pages in length and teacher approval. Assessment for each book is a short, word-processed composition that is revised until error-free.
- ITED—Written Expression test; must achieve at least 4th stanine.

English—Second part, up to 2 credits, based on credit deficiencies.

- PLATO Literature and the Arts—GED Prep

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[2] This was PLATO Reading 1 & 2. Since this study the reading curriculum has been replaced with new courseware.—*ed.*

[3] This curriculum is scheduled for phased replacement beginning in 2003.—*ed.*

Library Books—One for every half-credit earned, 180 pages in length and teacher approval. Assessment for each book is a short, word-processed composition that is revised until error-free.

Other—One teacher said, "Students do English, Art and Music surveys using a CD ROM from Clearview CAI".

ITED—Literary Materials test; must achieve at least 4th stanine.

Math Fundamentals—required, based on credit deficiencies.

PLATO Math Fundamentals (complete) and Mathematics portion of GED Prep[4]

Performance Assessment Sheets—eight teacher-developed, word-processed compositions on how they solved the problem, which students revise until their answers are error-free. The titles for the compositions are: Chocolate Bar Problem, Snack Foods, Oreo Cookies, Shopping Carts, Zoo Problem, How Many Cookies, and Creative Tangrams.

ITED—mathematics test, must achieve at least 4th stanine.

Science—Up to 4 credits, one for each course. Students may improve a former course grade of D or F.

Track One requirements: Integrated Science, Life Science, Physical Science; elective—Earth/Space

Track Two Honors requirements: Biology, Physical Science; electives—Earth/Space Science, Chemistry

PLATO—Depending upon track and former classes taken. Earth/Space Science, Life Science, Physical Science--all at the basic level. Biology and Chemistry at the Intermediate Level. All students will do the *Rediscover Science Series* (RDS) RDS Science Skills/Working with Science, a basic level course.[5] All lessons will be completed and Mastery Tests will be passed at no less than 80%.

Performance Assessment—Create instructions for a scientific experiment, based on materials supplied by the instructor. Write-up must be word-processed on Corel.

ITED—Science test, 4th stanine

Social Studies—Up to 2.5 credits, one per history course and .5 for other courses.

PLATO—Social Studies and GED Prep[6]

Other--Seven chapters in the text

Performance Assessment—A biographical paper on the presidency and a Supreme Court justice; three to five pages using at least three sources, on a related topic. Also, 90% on the Naturalization Test (100 items most likely to be asked on the U.S. Naturalization Test)

ITED—Social Studies test, 4th stanine

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[4] This curriculum has receiving a major phased upgrade beginning in 2002.—*ed.*

[5] This curriculum has been replaced with offerings from PLATO's CyberEd division, and other offerings.--*ed*

[6] These curricula have been replaced since this evaluation.--*ed*

Health—One-half credit, required for graduation

PLATO—RDS Life Science section on Human Beings
RDS Biology section on The Human Body
RDS Health
80% Mastery

Other—Assigned chapters from five health education booklets. Answers for each booklet word-processed, turned in when a booklet is complete.

Performance Assessment—Test on each health education booklet until 85% correct. Also, a five-paragraph reflection paper, one for each booklet.

Sources of Information—One elective credit

PLATO—Reading Reference and Technical Material with Assessment" and reference materials

Other—Five projects, word-processed and error-free.

ITED—Sources of Information test, 4th stanine.

Consumer Education—Non-PLATO course consisting of five booklets, five tests, and two projects: "Personal Budget Project" and "Personal Phone Directory."

Student Computer Use. Students choose exactly where they spend their time each day, but they must be working either at a computer or in the school library. During the AIS lab time students may work on reading, writing, or project work as well as their computer work—"whatever needs to be finished". Students are encouraged to do their reading at home, but they may read in class; they are likely to write their papers on the computers at school, since they are required to word process all of their work.

All students sign in every day next to the number of the computer they will be using, and they are not allowed to change during class. (Teachers credit this identification process for having little mischief on equipment.) Learners work alone and quietly at their machines; they are not allowed to bring in CD's or listen to music because many students need to have quiet in order to work. Learners may—and do—ask questions and receive tutoring as needed to do lessons. Two teachers said, "The first week or so in the program students may have sore eyes from spending 180 minutes at a time on a computer, but they get used to it."

Students start the program by going right into the English Fundamentals, which all are required to complete. They also read a one-page document that teaches them how to do a Reuther paper. "The work is very spelled out the first week of school, working with PLATO." Throughout a quarter, "We try to get them to do their book reading at home—their writing assignments too. If they want to change off [and do those things rather than PLATO], fine. They do learn how to balance their time." After English, students do the Math Fundamentals and the GED Prep for both subjects.

Students are required to do all of the sections in any given PLATO module. Students keep track of their own progress through a course on a prepared paper checklist, kept by the teachers; a teacher must initial each entry. Students mark when they have completed

a tutorial and record their scores on drills. A score of 80% is required on the drills before students are allowed to take a mastery test. They must then pass the mastery test on the first or second try; in rare instances they may take a test a third time. Most students show improvement on their mastery tests, teachers said. Scores are kept in student folders; occasionally teachers refer to them, to verify if something was completed. Sometimes teachers need to refer to that paperwork for students who have not shut down correctly and have lost records of their work.

Monitoring Student Achievement. One of the two educators in each lab takes attendance, using Grade Book Plus, and calls student homes if anyone is absent; the other one does the computer trouble shooting. During interviews, teachers reported: "We monitor regularly what students are doing on the computer—to be sure that they are completing all parts of a lesson—and whether they need help." They also refer to student checklists and files when needed.

In addition to records monitoring, all of the interviewees said, "We do tutoring or answer questions for students who are in a tutorial, practice, or drill." One teacher regularly tutored two students through the year. Teachers agreed that they do not help students with mastery tests. "We do not help them with mastery tests or assessments, even when students ask desperately, which they commonly do. 'I need this answer,' they may say. I answer, 'I need to know if you can do this.'" Some students have had other sly ways to improve their test scores. These learners started tests, took notes on the answers, and then used "Alt-Control-Delete" to re-start the test without any tracking or penalty for their first attempt.

One teacher reported, "[Students] don't ask questions on PLATO, more on performance assessments [such as reports]." All of the teachers help or tutor students who are working on their projects or reports; they explain the district standards for papers, such as margins and headings, and demonstrate how to set such things up on the computer. One teacher said, "I act as a facilitator for projects. I give topic ideas, proctor them, get them set up in the program. I'm there to help them out, help them stay on task." Students type their work in the labs and re-write until their copies are free of errors. Teachers feel that this is a good experience for them, both in learning how to do a paper and in pursuing their work until the final product is excellent.

When each student begins the AIS program, or a quarter, they take the Iowa Test of Educational Development (ITED), usually Form K, to determine their educational level for one or several subjects they will be taking. All students, even a sixteen-year-old, is tested as if they were a graduating senior—12th grade, 6th month. At the end of their PLATO work on a subject they are given another version of the ITED (usually form M) to determine the final grade for the course they have completed. ITED pre- and pretesting are done at specific times during the regular year; during the summer they are done on an as-needed basis. In addition to the ITED, students are also given some paper and pencil assessments of their mastery of state and district standards. Grades are determined solely by the results of the ITED on the following scale:

Below 4th Stanine	½ credit
4th Stanine	D
5th Stanine	C
6th Stanine	B
7th Stanine	A-
8th or 9th Stanine	A

Charlotte said that in the district as a whole "approximately 30% of the kids can't pass their grade level on the ITED but our kids do. At the end of their experience, most pass. If they fail anything it is math; that is a weak area in our district." Marie said, "In the middle of the summer we gave the first round of ITED tests. The lowest score was 5, and the district calls 4 passing."

Encouraging Student Performance. Encouragement for student involvement comes from verbal reminders of what they should do, the importance of their work, and standards of performance. One teacher said, "We encourage them to be involved in what they are reading and tuned into what they are doing. One without the other does not work." Another explained, "They know the faster they go, the faster they get out. Most stay focused. They never would have finished on time in any other program, but this one benefits from time on task. They are regimented. They have the incentive—they can move on."

"We remind them that everything they are doing is pointed toward passing the final ITED exam. This is a high stakes test; it is all or nothing. 'High risk' students—which many of these are—are likely to 'blow off' such tests, but these kids don't. At the end of their work their grades depend on it; they take it carefully and seriously."

The external behavior requirements and prodding also serve to create a consistent learning environment. "I get on their case if they are sleeping or dawdling: 'If this isn't the program for you we will get you in one that is.' Usually that snaps them back. They also know we are serious about attendance because they hear us make the calls to their homes when someone is missing, and they know students are moved to another program if they do not get their 90% attendance on time." Another said, "We move them out if they are noisy. We keep quiet labs; any noise interferes. It is an expectation."

Teacher selection is probably a part of the success of this program. "Teachers are hand-picked" for their personalities and willingness to work positively with these special-needs students. All three who were interviewed for this report had several years of teaching experience and were ready for a change to something new. They all like the students and PLATO very much. One said, "There are no tokens, or anything. I let the students leave five minutes early if they work well. I am flexible. The staff is friendly."

Learning Materials. Of the four teachers who were interviewed, three did not know, or perhaps remember, that they have the option of using PLATO papers for additional practice and application. One teacher said that she knew about a CD from which papers could be printed and had used it once at the beginning of the AIS program. She started

the printer and left it for a few minutes, and when she returned there was a pile of paper—much more than she wanted, and not exactly what she wanted. "It was hard to get exactly what I wanted to print," she said, explaining that she thought maybe the small pictures of pages, several to a screen, might have been too small to discriminate.

Students choose a book to read for English, and for Language Arts they are required to write a report on a topic. Students taking math are given an assortment of math problems for problem-solving, provided on paper. John uses a textbook for Political Science as well as PLATO, because: "There is no Internet in the lab—it has been removed—they go to the library for it. We had students surfing at the beginning and decided it was best to get rid of it."

PLATO Problems and Suggestions. Hardware and software problems are first handled by teachers. One teacher said, "There are occasionally glitches where the program goes down, but generally speaking things work well." Another teacher said that there had been several problems. Those situations that do not yield to their work are referred to the district, which now has two technicians assigned to Reuther and other schools.

One teacher elaborated on help for PLATO: "I teach at night during the regular year; I used to do database repair every night. PLATO trained a district person—that has been great. If he can't do it, he calls the PLATO hot line. I used to do it—call the hot line—and sometimes spend a long time waiting for an answer. I don't have time for that."

Most of the teachers commented about their need for faster hardware. "At the beginning of summer 2001, PLATO sent disks that we could not use, but that was because of our hardware. It required more memory than we had at first. The technician worked with it for four days and finally it just fried. The district then had to rebuild the server. Everything seems so slow; it takes forever to get student records—it's our hardware." (Another teacher added, "Now they've changed the processor it is better. We could use better hardware: we started with a Pentium I, now have a no. 966 Pentium 3; a 1.5 Athelon is what I want...and a T1 line.")

All of the Reuther staff track student work with paper checklists. Their first experiences with printing student records had produced piles of paper, much of which was not helpful, and they never used the print capacity again. While discussions did not produce suggestions regarding possible PLATO solutions, their overall comments indicated a need for simple, concise class reports with basic information about parts of activities that are completed and scores, where applicable.

Additional comments may be found at the end of the Data Analysis section.

Data Analysis

PLATO Use and Test Scores

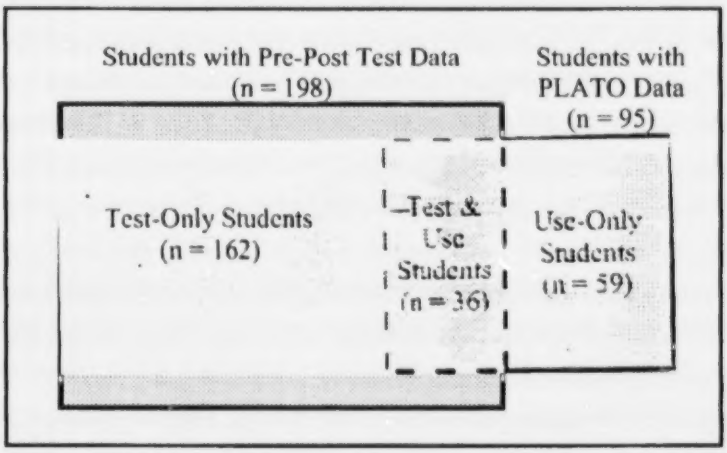
Sample. Students in this study used PLATO as part of five of the seven programs offered at Reuther High School during the 2000-2001 school year: June 2000 to May 2001. Students in the following programs were included in the sample: Full-time AIS, Part-Time AIS, Transition, KAPPS, and Credit Completion. These programs have been described earlier in this report.

Students were selected for the study if they had pretest and posttest scores and/or if they had PLATO use data for this time period. Reuther records for the ITED test scores identified a total of 198 Reuther students with pre- and posttest data on at least one test scale. PLATO system data contained use data for a total of 95 students. A total of 36 students had complete data sets with at least one set of test scores and PLATO use data. The students with both test data and PLATO use data will be called the test-and-use students in this report.

A group of 162 students had at least one set of pretest and posttest scores but no PLATO use data. In this report this group will be called the test-only students. It appears that for the majority of these students PLATO use data was deleted from the system database. (Program practice was to delete PLATO system records for seniors and other students when they left the Reuther program.)

A group of 59 students in the study had PLATO use data but not complete pretest-posttest data. In this report this group will be called the use-only students. Typically, these students started the program and began to use the PLATO system. However, they may have been transferred to another educational program, not yet completed required PLATO activities before taking the posttest, moved away from the school, or dropped out of the program. Depending upon the measure being discussed, data will be reported for the 198 test-only students, the 95 use-only students, and/or the 36 test-and-use students with complete data. Figure 1 shows a diagram of the samples used in the study.

Figure 1. Sample Distribution by Data Available



Pre- and Posttest Data. The Iowa Test of Educational Development (ITED) was used to pretest and pretest students in the Reuther High School programs. ITED has eleven scales that can be administered individually or together. Students could take the tests at the start or end of any quarter during the 2000-2001 school year. A list of the eleven test scales is in Figure 2 and Table 1. Generally, but not always, alternate forms of the test were used for the pre- and pretests. Most pretesting (95.9%) was done using ITED form K; most pretesting (88.5%) was done using ITED form M. Using alternative test forms helped control for increases in scores due to practice taking the same test.

Scale scores are reported in terms of national percentile rank. A score of 50% represents the middle score for a national sample of comparable students. It means that half of the national sample would score at or below the 50th percentile. A score of 60% means that 6 out of ten students nationally score at or below this point. Higher percentages represent higher achievement relative to the national sample of students. In addition to reporting pretest and posttest national percentile ranks, the pre- to post-difference in percentile rank is also reported. The level of change in test scores is a better indicator of the effect of the PLATO program than the pre- or posttest scores alone.

It is important to note that all Reuther student scores were evaluated by the Reuther staff as if the students were in the 12th grade the 6th month: the point when students should be prepared to graduate from high school. Given the purpose of the Reuther program, this practice was judged to be a reasonable way of interpreting the data. The effect of doing this is that younger test takers would receive somewhat lower scores than they would have if they were evaluated at their true age or grade level. This should be remembered when comparing tests scored from two groups that differ in age.

All Student Scores. The total group of 198 students with pre- and posttest scores had an average of 3.8 pairs of test scores for the 2000-2001 school year. The middle half of these

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students had from 2 to 5 pairs of scale scores. There were 756 pairs of test scores for the 198 students. Moderately high, positive correlations were found between the pre- and post-scores on all eleven tests. The correlations ranged from a low of $r = .598$ for Expression Advanced Skills to $r = .886$ for Reading Total. This measure of test-retest reliability with alternate forms indicates adequately high test reliability. (Reliability is a necessary characteristic for any measure used to assess gains in student achievement.)

The total group of 198 students with pre- and posttest scores had a mean national percentile rank of 47.9 percent on the pretest and 57.2 percent on the posttest. When the pairs of test scores were compared from the pretest to the posttest, statistically significant gains were found for all eleven measures and for the combined score. Subtracting the pretest score from the posttest score yields a mean gain of 9.3 percentage points with a range of 5.6 to 15.2 percent gains. The largest gains were achieved for Sources of Information (15.2%), Quantitative Thinking Total and Advanced (15.0% and 14.4% respectively), and Science (9.5%).

One common way of judging how meaningful differences between two means are is to use the average standard deviation of the pre- and post-scores (effect size) as a measuring stick. Doing this we find that the median gain of 9.3 percentage points is 0.40 of one standard deviation in size. This magnitude of difference is usually considered small to moderate but potentially educationally meaningful. The range of gain scores in standard deviations is from 0.26 to 0.79, ranging from small to fairly large gains.

Table 1. ITED Scores for All Reuther Students (n = 198)

ITED Scale	Pretest	Posttest	Difference	Effect Size
Literary Materials	47.5%	53.0%	5.6%	0.2554
Reading – Vocabulary	31.1%	37.8%	6.7%	0.3357
Expression Total	48.6%	55.6%	7.0%	0.3356
Expression – Advanced Skills	46.7%	53.8%	7.2%	0.3343
Social Studies	53.2%	60.4%	7.3%	0.3180
Reading – Total	45.4%	52.7%	7.3%	0.3167
Reading – Content Area Reading	53.2%	60.8%	7.5%	0.3265
Science	59.7%	69.2%	9.5%	0.4239
Quantitative Thinking – Advanced Skills	46.0%	60.4%	14.4%	0.5510
Quantitative Thinking - Total	46.3%	61.3%	15.0%	0.2902
Sources Of Information	39.1%	54.3%	15.2%	0.7853
Average of All Scales	47.9%	57.2%	9.3%	0.3994

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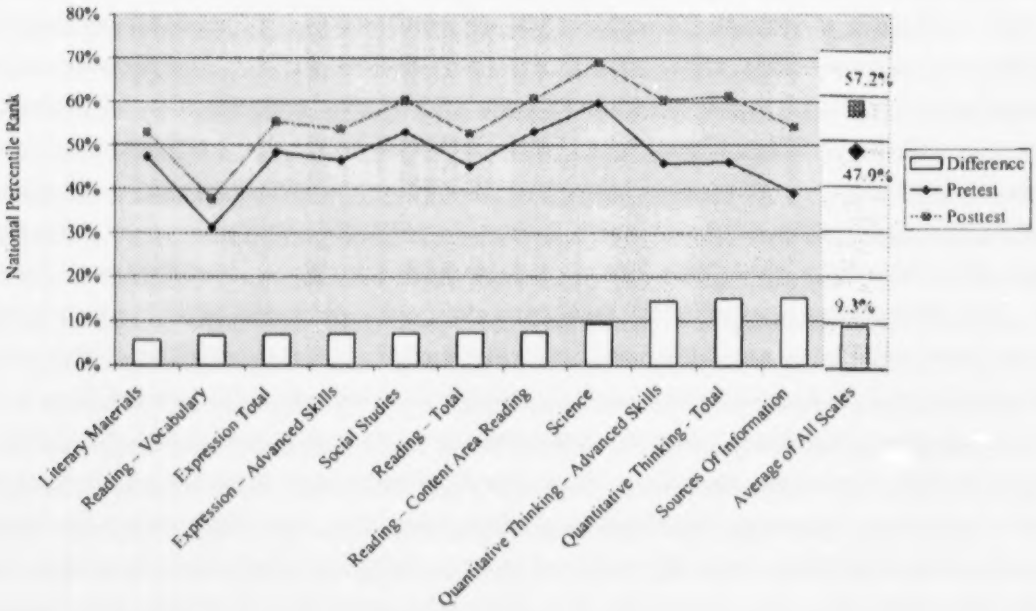
Figure 2. Mean Pre and Posttest Scores (n = 198)



Test-and-Use vs. Test-Only Students. One issue in evaluating the test data is whether or not the students with complete data (test-and-use students) are similar to the students with partial data (test-only students.) If they are similar then we can use the complete set of 162 students to describe PLATO test outcomes. If they are different then we need to restrict our attention to those students with complete data. This section of the report looks at some comparisons between these groups to help us decide if it is reasonable to look at all students together. What the analysis shows is that the two groups are similar in some characteristics, but not in all.

The amount of data for both groups was fairly similar. There were 131 records with pairs of scores for the test-and-use students; the test-only students had 625. This is an average for the 36 test-and-use students of 3.6 pairs of test scores; the 162 test-only students had 3.9 pairs of scores. The middle half of the test-and-use students had between 2 to 4 pairs of scores; the middle half for the test-only students was 2 to 5 pairs.

The test-only students had higher pretest and posttest average scores than did the test-and-use students. The test-only group average of all scales was 50.7 percent on the pretest and 60.2 on the posttest; the test-and-use students had 37.7 percent on the pretest and 46.3 on the posttest. Given that all of the test-only students have "graduated" from the Reuther program, these students would be somewhat older than the test-and-use students at the time of some of their tests. This is one factor contributing to the higher scores for

the test-only group. In addition, students who "graduate" from the program may have somewhat higher entry ability than the group of students who are still in the program, some of whom may not graduate.

Table 2. ITED National Percentile Rank by Group

Subtest Scale	Group	Number of Test Pairs	National Percentile Rank		
			Pretest	Posttest	Difference
Literary Materials	Test-Only	42	50.3%	57.0%	6.6%
	Test-&-Use	16	39.9%	42.7%	2.8%
Reading – Vocabulary	Test-Only	25	35.2%	41.2%	5.9%
	Test-&-Use	8	18.3%	27.3%	9.0%
Expression – Advanced Skills	Test-Only	70	49.3%	56.8%	7.6%
	Test-&-Use	21	38.0%	43.9%	5.9%
Expression Total	Test-Only	70	51.1%	58.5%	7.4%
	Test-&-Use	21	40.3%	46.0%	5.7%
Social Studies	Test-Only	48	54.7%	61.8%	7.0%
	Test-&-Use	15	48.1%	56.1%	7.9%
Reading – Total	Test-Only	19	50.3%	57.3%	7.1%
	Test-&-Use	6	30.0%	38.2%	8.2%
Reading – Content Area Reading	Test-Only	19	57.9%	65.8%	7.9%
	Test-&-Use	6	38.5%	44.8%	6.3%
Science	Test-Only	54	61.9%	72.5%	10.5%
	Test-&-Use	13	50.5%	55.5%	5.0%
Quantitative Thinking – Advanced Skills	Test-Only	58	48.6%	62.1%	13.4%
	Test-&-Use	8	26.6%	48.1%	21.5%
Quantitative Thinking - Total	Test-Only	58	48.7%	62.3%	13.6%
	Test-&-Use	9	30.8%	54.7%	23.9%
Sources Of Information	Test-Only	27	42.0%	57.9%	15.9%
	Test-&-Use	8	29.4%	42.3%	12.9%
Average of All Scales	Test-Only	490	50.7%	60.2%	9.5%
	Test-&-Use	131	37.7%	46.3%	8.5%

When the pretest levels of ability are taken into account statistically, the two groups begin to look more similar. The test-only students had an average percentile gain of 9.5 percent and the test-and-use students had a gain of 8.5 percent. While this is still a statistically significant difference (F (1,598) = 6.597, p = .01), it is a relatively small difference, with an effect size of only .11 standard deviations. Table 2 gives the subscale scores for the test-only group and the test-and-use group.

Another indicator of how similar the test-only students and the test-and-use students were is gained by examining the programs they were enrolled in at the time of the pretest. Table 3 lists the number of students and test records used in the study by program

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enrolled in. The test-and-use students were not statistically different from the test-only students in terms of program represented (X^2 (4) = .202, p = .995).

Table 3. Number of Students and Records of Pre-Post Test Scores for Study

Program	Number of Students				Number of Pairs of Test Records			
	Test-Only Student Data		Test-and-Use Student Data		Test-Only Record Data		Test-and-Use Record Data	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Full-time AIS	77	47.5%	18	50.0%	354	56.8%	89	67.9%
Part-time AIS	24	14.8%	8	22.2%	52	8.3%	15	11.5%
Transition	32	19.8%	9	25.0%	138	22.2%	25	19.1%
KAPPS	19	11.7%	1	2.8%	65	10.4%	2	1.5%
Credit Comp.	10	6.2%	0	0.0%	14	2.2%	0	1.0%
Total	162	100.0%	36	100.0%	623	100.0%	131	100.0%

The decision to combine groups for analysis versus considering them as separate groups is made based upon several factors. If the groups appear to be similar on relevant measures, and if we are interested in looking only at the whole sample, then combining the groups makes sense. However, if the groups appear to be meaningfully different on relevant measures, or if we are interested in subgroups, then analyzing groups separately makes sense. In some cases the groups may be only moderately different from each other; in these situations whether or not to combine groups for analysis is a judgment call. For this report we will report either combined or subgroup findings when the case is clear cut. When the case is less clear, we will report both group and subgroup statistics so that the reader may decide.

PLATO Use Data. The PLATO use statistics include a number of variables, including sessions spent on activities, time spent engaged with activities, number of activities completed, and number of activities mastered. These statistics give an indication of the extent and level of PLATO use at Reuther. Of all use statistics, number of modules mastered has been most indicative in past studies of the likely impact of PLATO on student learning.

A total of 95 students were identified from the PLATO records as students enrolled during the 2000-2001 school year. The small number of records compared to the larger number of participants in the program (around 250 per year) is due to the school's practice of deleting student records from the PLATO system when students leave the program. Among the 95 students in the system when data was collected, 36 had both PLATO use data and pairs of test scores for the study period (test-and-use students); 59 students had only PLATO use data (use-only). The entire sample of 95 students mastered an average of 103 modules per student during the 2000-2001 school year out of the 297 completed. Students spent an average of 46.5 hours to do this during a total of 676 times working on activities.

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The PLATO use statistics were considerably higher for the 36 test-and-use students than for the 59 use-only students. For the use-and-test students the average number of modules mastered was 131; the use-only students had an average of 86 modules mastered. This is a moderate size difference, with an effect size of .471 standard deviations. Similar differences in PLATO use were seen in the other PLATO system variables. This finding is consistent with the explanation given earlier for why the use-only students were in the data. Lower levels of PLATO use would be associated with new students on the system or students with low attendance rates; these students would also tend to not have complete sets of pre- and posttest scores. Sum of PLATO activities mastered will be used for further analysis in this report as it is the best indicator of effective use of PLATO by students.

Table 4. PLATO Use for Students Matched and Not Matched to Test

Variable	Statistic	Student Group			t-test for Equality of Means for Test-and-Use vs Use-Only Students			
		All (n = 95)	Test-&-Use (n = 36)	Test-Only (n = 59)	*t*	*df*	Sig. (2-tailed)	Effect Size
Sum of sessions on PLATO activities	Mean	676.1	926.2	523.6	-2.833[a]	55	0.006	0.636
	Median	482.0	705.5	335.0				
	Std. Dev.	641.7	752.5	513.0				
	Min.	7.0	7.0	11.0				
	Max.	2835.0	2835.0	2304.0				
Hours of engaged time	Mean	46.5	60.2	38.2	-2.725[b]	93	0.008	0.564
	Median	33.1	52.7	21.5				
	Std. Dev.	39.5	43.3	34.8				
	Min.	1.1	1.1	1.1				
	Max.	159.4	159.4	152.6				
Sum of PLATO activities completed	Mean	297.2	393.4	238.5	-2.748[b]	93	0.007	0.573
	Median	223.0	342.0	156.0				
	Std. Dev.	275.6	308.8	237.3				
	Min.	2.0	6.0	2.0				
	Max.	1254.0	1254.0	1056.0				
Sum of PLATO activities mastered	Mean	103.2	130.8	86.4	-2.277[b]	93	0.025	0.471
	Median	79.0	125.0	63.0				
	Std. Dev.	94.1	105.7	82.7				
	Min.	0.0	2.0	0.0				
	Max.	475.0	475.0	455.0				

[a] Equal variances not assumed [b] Equal variances assumed

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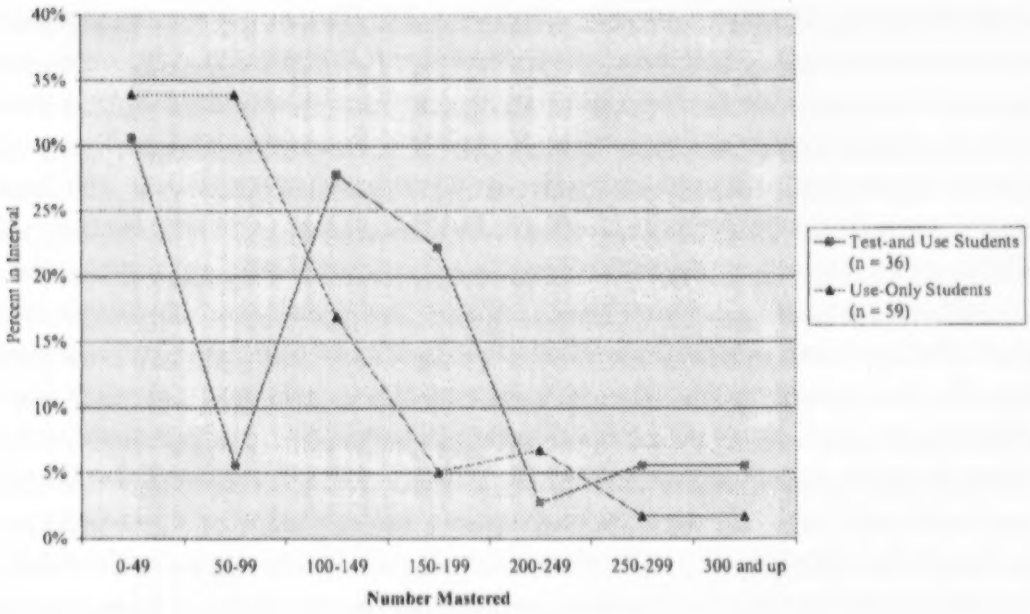
While the subgroup statistics are significantly different, it may still be useful to look at the entire group statistics. Aggregated together, Reuther students mastered about 37 percent of all modules completed in this year. They spent an average of a little more than 9 minutes per activity completed and 27 minutes per activity mastered. This level of use is consistent with the implementation strategy used at Reuther.

Figure 3. Distribution of Modules Mastered by Student Group



PLATO Use and ITED Scores. When we examined the relationship between the numbers of PLATO modules mastered and ITED scores for the 131 pairs of tests in the test-and-use data, we found that there was a positive relationship between number of modules mastered and posttest ITED scores. The number of modules mastered correlated significantly with the posttest score ($r = .277$, $p < .01$) but did not correlate at all with the pretest score ($r = -.01$, $p > .05$). This suggests that mastering PLATO modules benefits both lower and higher entry skill students. (As discussed before under test reliability, the correlation between the ITED pretest and posttest scores was strongly positive: $r = .702$, $p < .01$.)

When a linear regression analysis was run with the posttest as the dependent measure and activities mastered and pretest score as the independent measures, there was a significant relationship for both the pretest and activities mastered in predicting increases in posttest scores. This type of analysis allows us to examine the contribution of each independent variable separately. Based on the regression analysis, we would predict that the posttest

score would increase by one percentage point—say, from 48 percent to 49 percent--for every 15 or 16 PLATO modules mastered. Figure 4 presents a three dimensional graph which shows that increases in posttest ITED combined scores result from increases in the number of activities mastered and pretest ITED scores. It shows generally that mastering more PLATO modules increases posttest scores for students at all levels of pretest scores.

Table 5. Regression ANOVA (Dependent Variable: Posttest National Percentile Rank)

Model		Sum of Squares	df	Mean Square	F	Sig.
Predictors: (Constant), Sum of PLATO Activities Mastered, Pretest National Percentile Rank	Regression	48095.229	2	24047.614	85.847	.001
	Residual	35855.748	128	280.123		
	Total	83950.977	130			

Table 6. Regression Coefficients for Dependent Variable: Posttest National Percentile Rank

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Predictors: (Constant), Sum of PLATO Activities Mastered, Pretest National Percentile Rank	(Constant)	7.491	3.408		2.198	.030
	Pretest National Percentile Rank	0.785	0.064	0.704	12.195	.001
	Sum of PLATO Activities Mastered	6.35E-02	0.013	0.284	4.913	.001

R = 0.757, R Square = 0.573, Adjusted R Square = 0.566

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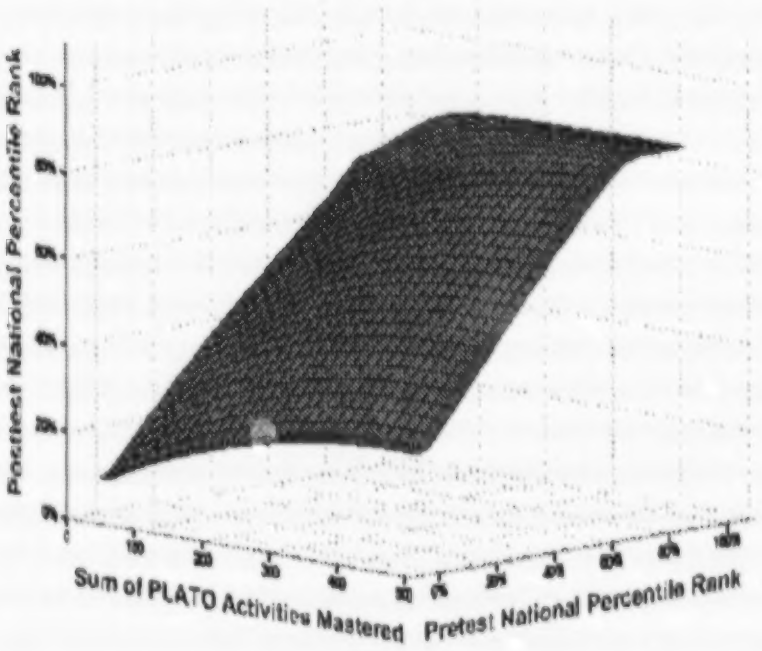
Figure 4. Effect of PLATO Mastery and Pretest on Posttest Scores



Instructor's PLATO Evaluation

Five of the Reuther instructors answered surveys about their experience with PLATO. The evaluation survey asked 41 questions about teacher use of PLATO, divided into three sections. Part I had 28 questions about the PLATO products and their use, with a five-point scale of answers, from "Strongly Agree" to "Strongly Disagree." Part II of the survey asked how often teachers gave instructions to students regarding the use of the PLATO system; teachers answered on a six-point rating scale, from 5 (daily) to 0 (never). Part III of the survey posed seven open-ended questions, to be answered in writing.

Course Content. Most teachers agreed that PLATO content was good, PLATO objectives aligned well with their own, and that PLATO content aligned well with their standardized final tests. Respondents agreed or were neutral about PLATO content being up-to-date. Teachers were less positive about the content being understandable for students and were mixed in seeing the content as being free of errors and having adequate depth. Subjects that were taught accounted for differences in points of view, with social studies receiving most negative comments in interviews.

Figure 5. Reuther Teacher Course Content Ratings

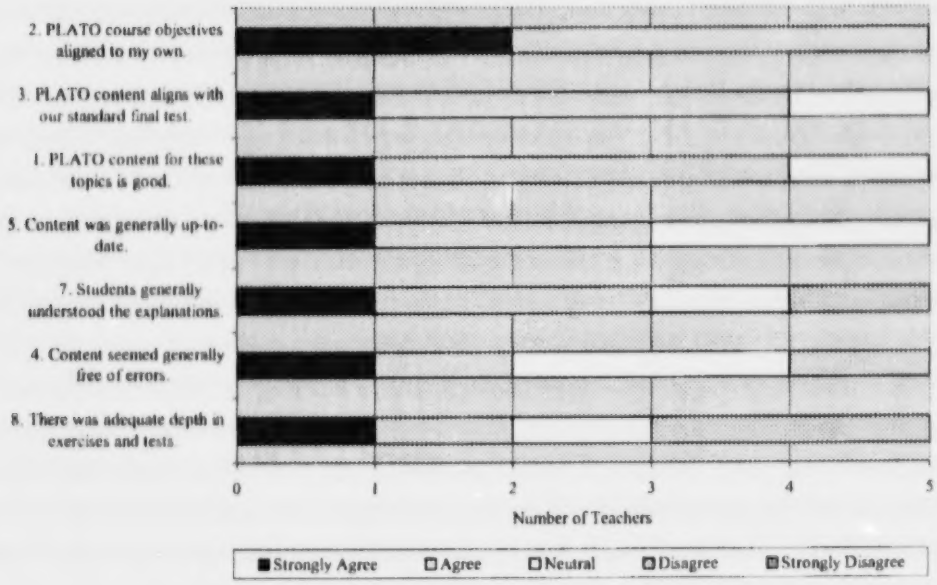
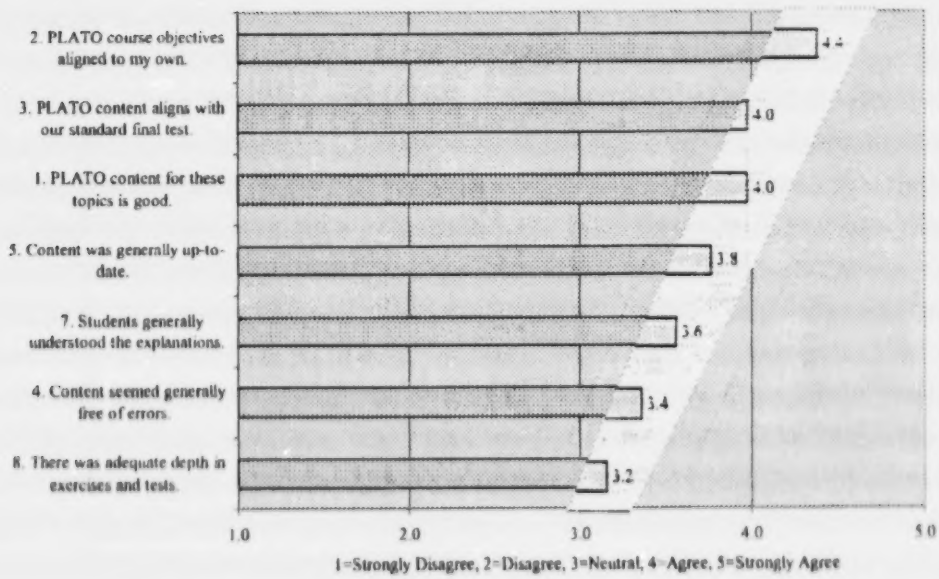


Figure 6. Reuther Teacher Content Mean Rating



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Instructional Design. Four of five teachers strongly agreed that they were adequately trained to use PLATO and that students had enough time on PLATO. Teachers generally agreed that all lesson parts aligned with the Instructor's Guide, the tutorials involved students through an interactive style, and the quality of instruction was consistent throughout. Only one of the five teachers agreed that more training in using PLATO was desirable; that teacher had not received as much formal training.

Figure 7. Reuther Teacher Instructional Design Ratings

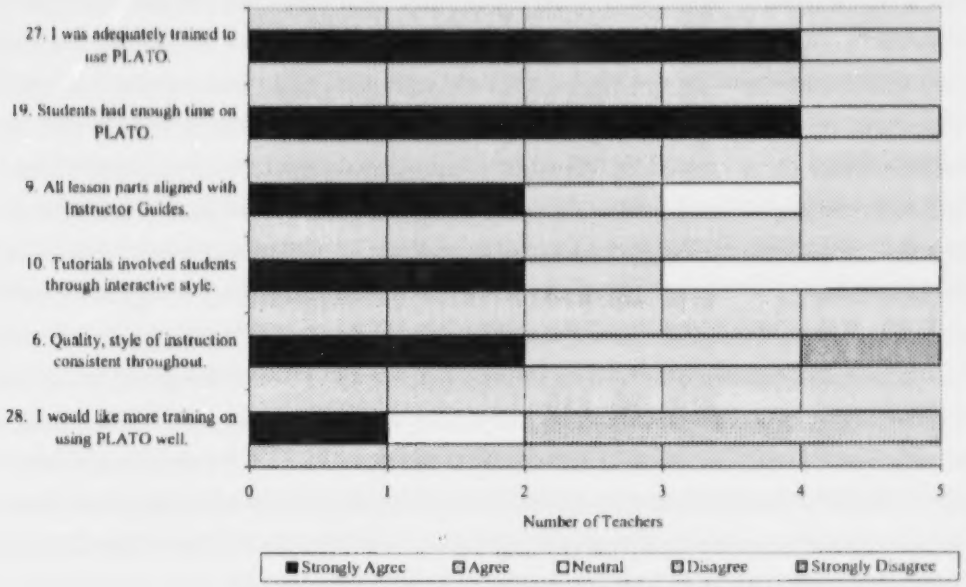
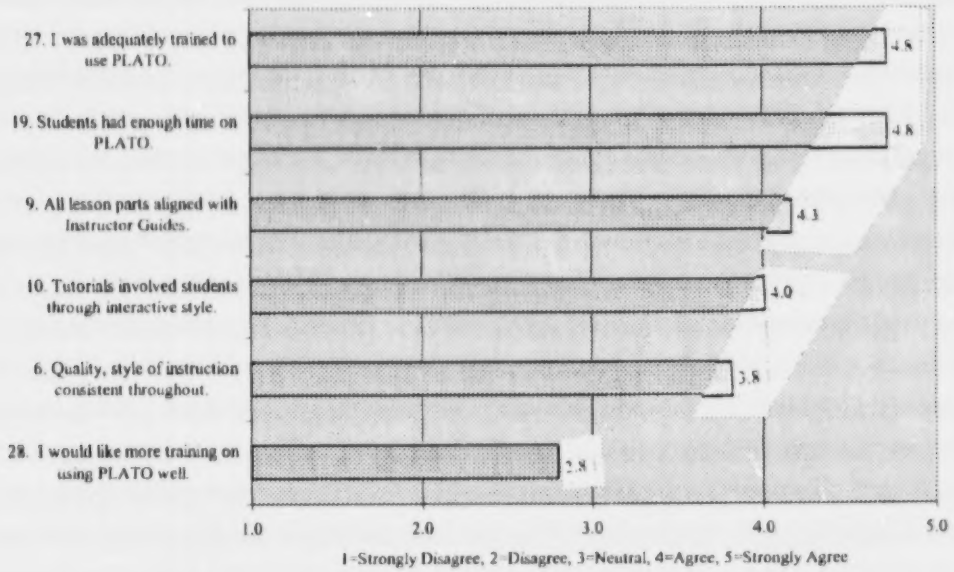


Figure 8. Reuther Teacher Instructional Design Mean Rating



Teacher Experience with PLATO. Teachers strongly agreed or agreed that PLATO screens were readable and that a consistent interface was required in the courses. On average, they were positive to neutral in their perception of graphics and color used in the visual presentation of the lessons; subject matter was the separating factor. The ratings for the 'software being free of bugs or errors' indicates the problems this site has been having with managing large, divergent student databases and updating the system within the confines of their existing hardware.

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Figure 9. Reuther Teacher Experience with PLATO Ratings

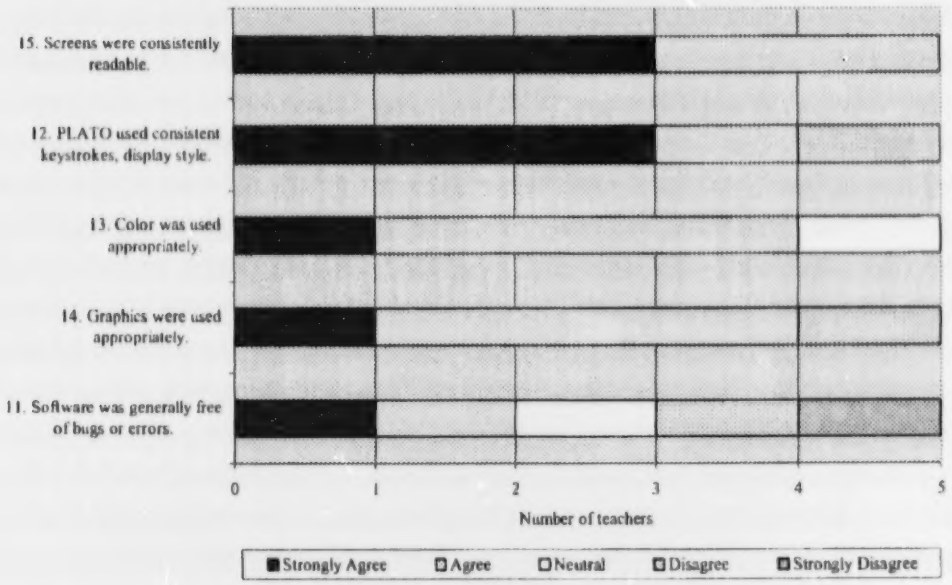
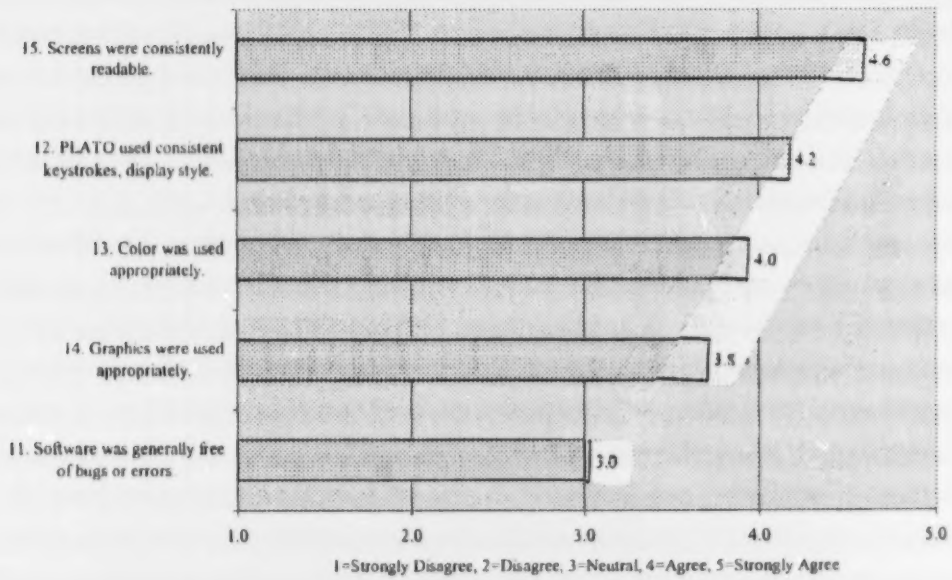


Figure 10. Reuther Teacher PLATO Experience Mean Rating



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PLATO Usefulness. Teachers were generally positive about the usefulness of the PLATO system. Two or three teachers strongly agreed or agreed that the system was productive, useful in teaching, and enjoyable to work on. Teachers generally agreed that it was easy to make student assignments on the system. Teachers were split about being able to use student progress reports, with two agreeing, two being neutral, and one strongly disagreeing. This response was the result of training and classroom practice.

Figure 11. Reuther Teacher Ratings of PLATO Usefulness

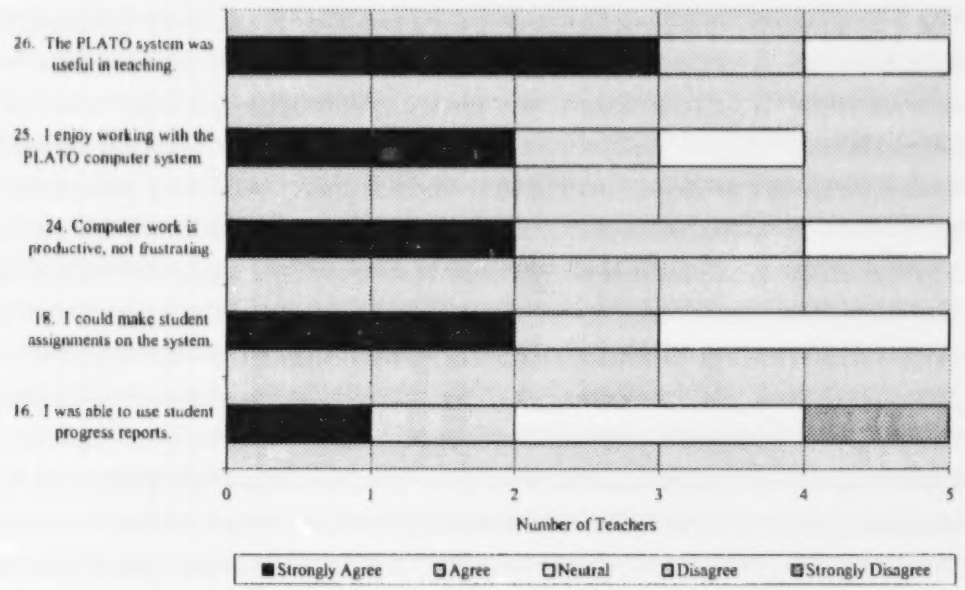
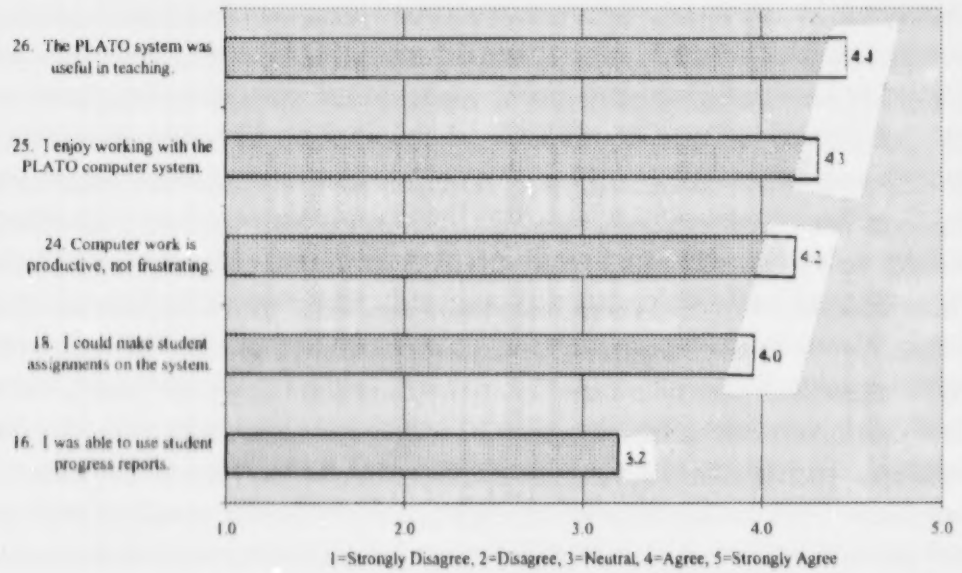


Figure12. Reuther Teacher PLATO Usefulness Mean Rating



Student Experience with PLATO. The five teachers were very positive in their rating that they could do tutoring while students used PLATO. As described earlier, teachers have a settled program and procedure for working with students, and classroom management allows them to be free to tutor. Teachers were positive or neutral regarding whether students responded well to PLATO. They were likewise mixed about their ability to relate PLATO to the classroom activities, which is not surprising, since the writing and reading assignments were not always directly related. Teachers were divided in rating the ease with which students could navigate in PLATO: two of the three teachers strongly agreed that they could manage well, one was neutral, and two disagreed with this statement. Again, subject matter made the difference here.

Figure 13. Reuther Teacher Ratings of Student PLATO Use

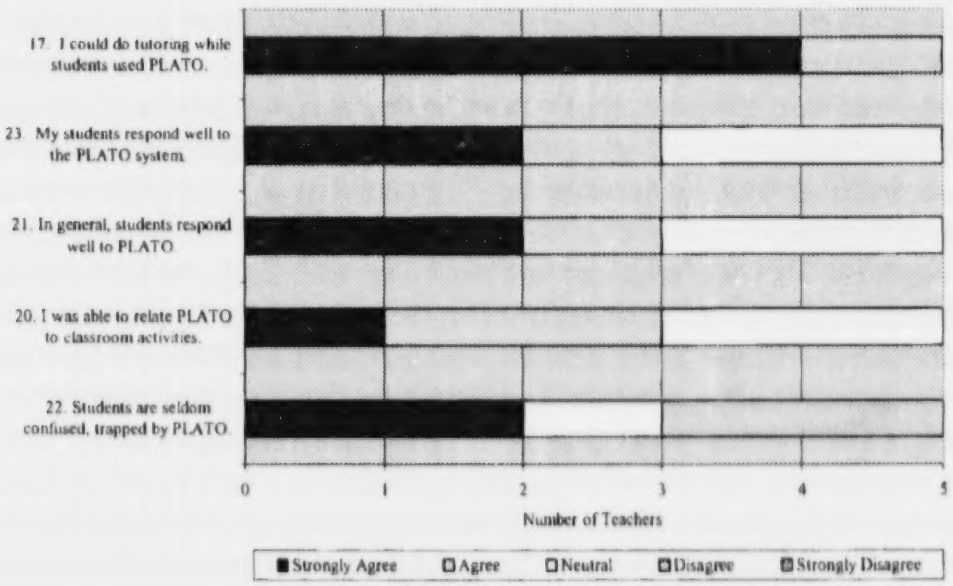
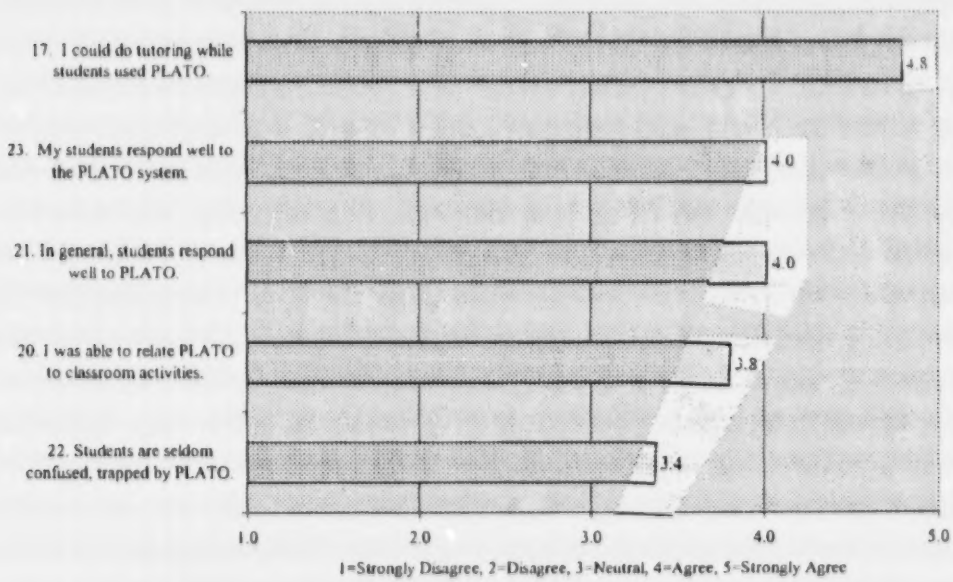


Figure 14. Reuther Teacher Student PLATO Use Mean Rating



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Frequency of Activities. The most frequent instruction teachers provided students about PLATO was to explain procedures for getting help on the system. Explaining incentives for doing well on PLATO was also mentioned by all teachers, though most did it only at the beginning of using PLATO. Only one teacher reported doing the other activities every time or most of the time. Most activities were explained occasionally, at the beginning of students using PLATO, or never.

Figure 15. Reuther Teacher Frequency of Activities

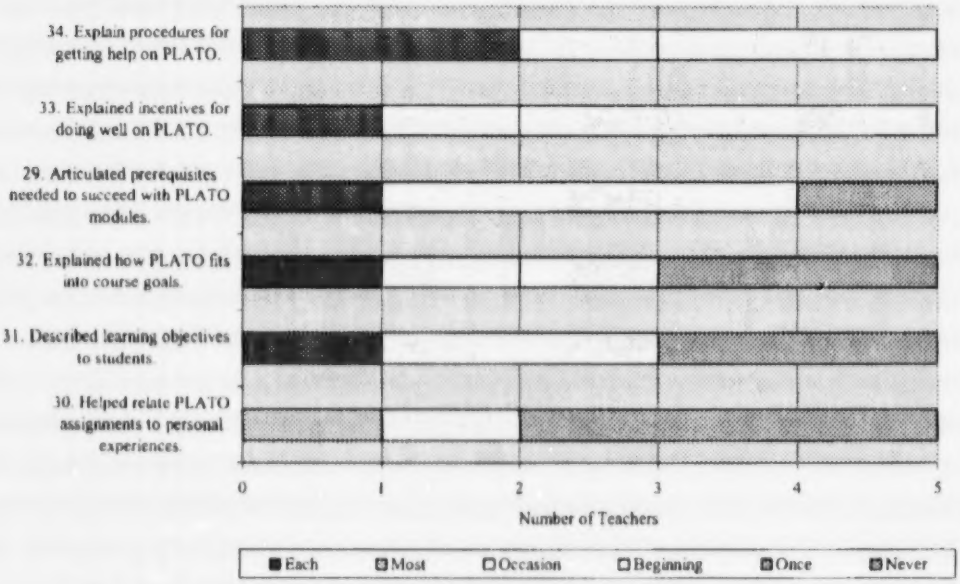
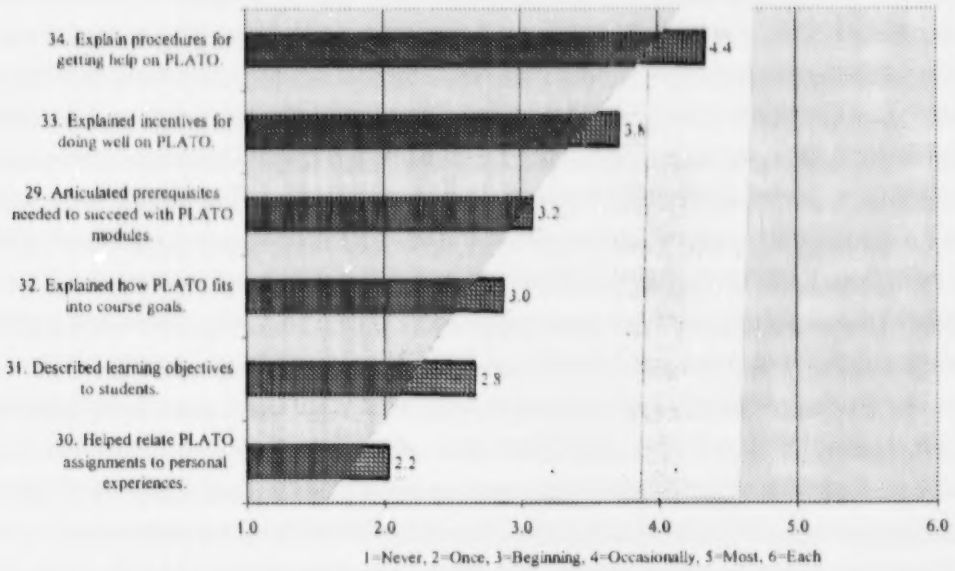


Figure 16. Reuther Teacher Activities Mean Rating



Open Ended Questions. Teachers were asked several open ended questions to gain their perceptions about the PLATO system and their use if it. Here are transcripts of what the teachers wrote.

1. What do you like best about teaching with the PLATO computer?

a. The opportunity for students to learn independently, at their own pace, in a structured way.
b. The immediate feedback for test/tutorial questions.
c. Ability to work with students individually and for students to work at their own pace.
d. Provides material rapidly to students, which fits our program objectives.

2. What do you like least about teaching with the PLATO computer?

a. Some students have learned how to cheat by using control/alt/delete during mastery and assessment tests.
b. The social studies lessons are very dry.
c. Students "cheating" through modules by keeping track of wrong answers or using "Control-Alt-Del" to get all E's on modules.
d. Program glitches, especially with the administrative portion. Program has chronically failed as of late.

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3. Was there a regular time within the sequence of a lesson or unit in which your students experienced their PLATO modules?

a. *Our program doesn't use these methods.*
b. PLATO delivered the curriculum to students who all worked on their own.
c. PLATO was generally used at the beginning of a subject. After PLATO was finished, most other performance assessments were done.
d. PLATO is completed twice within each course sequence. PLATO lessons are accessed daily.

4. Describe any strategies you employed to determine whether or not the PLATO modules assigned to each student were the most appropriate for ensuring their success in your class.

a. We pre- and pretest with the ITED and expect to see growth in learning.
b. We created a PLATO check-list on which we record the drill scores for each lesson. They must be at 90%.
c. Pretesting on the ITED gave us an idea which students had the reading and math skills required for PLATO.
d. Performance on standardized tests.

5. How would you change the PLATO lessons?

a. Social studies needs to be updated.[7]
b. Make social studies much more interactive.
c. I would have to have time to go through PLATO from beginning to end to give feedback on this.
d. Put a "lockout" function on mastery tests until the student has completed any tutorials and drills.

6. What suggestions do you have to improve the way you use the PLATO system?

a. We are pleased with the PLATO system.
b. We are happy with the way we use PLATO.
c. Scores need to be recorded for all subjects on menu screens.
d. Add more/revise content in social studies. Enhance science curriculum. Provide SAT preparation course work.

7. What other comments or suggestions do you have on the PLATO system or this course?

a. Update social studies.
b. Perhaps math could be more interactive also.[8]

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[8] A major upgrade and expansion of the math curricula began in 2002.

c. A print-out of E's, application and or drill scores, and stars module by module would be helpful. Also, a greater variety of items for testing to minimize cheating would be helpful.

d. Make the course work more difficult. Increase required reading level.

Suggestions for Changes in PLATO Lessons. The following comments were made during teacher interviews.

- Interaction with the program is very important, as are applications of principles, such as problem-solving. Colorful, interesting screens also help.

- Discovery Channel Science—"PLATO bought this and we are using it, the new software. It does problem solving, which asks kids to apply what they know, not just their knowledge. They can't just guess. Students like the immediate feedback of the computer but with Discover you never know [in the lesson] if your answer is right or wrong, and there is no answer book. It also does not have a pretest that asks what you already know, but it is very interactive [and that is good.] No one failed science this year; it teaches patterns and problem solving, like a chess game."

- World View Study—"No way to record grades."

- Social Studies—"This was not good last year because we had the old program—it had gray screens and was boring. It is better now. But students still need to get to map reading, charts, bar graphs, political cartoons—not just knowledge. Knowledge is harder to retain, and it is more boring."

- "Social studies needs to be updated regularly. History changes all the time. Of course it is not going to be cutting edge, but it could be better…Some of the social studies screens are plain and boring."[9]

- "In Social Studies, since the new program was installed in June, the final listing of E's and stars, for what was mastered, does not match the computer screen account of each student.—whenever they update us we have massive problems like this."

- "For social studies, revise the curriculum. Sometimes they make a mistake and get kicked out of the assessment test. In the interest of time, they go back in and get another chance to do the assessment, under another version of their name…"

- "A lot of kids had trouble with Literature and the Arts—the section on meter."

- Literature and the Arts—"The program is not recording all of the drill and application scores. We don't know when to take a student's word for it that they have done it."

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[9] This is a third-party product, and is updated regularly by the manufacturer.—*ed.*

- "In math there are a lot of little things—misspelling, problems in a mastery test that may not be in the tutorial. I have seen that and students comment on it."

- Teachers did not know that they could change the level of performance required for mastery. "Our last superintendent always wanted the mastery level to be 85% and we kept telling him that 80% is where the program sets it...How would we make it 85%? A lot of social studies tests have five questions; would they make the test longer [in order to make an extra 5% possible]?"

- "The assessment test is too long. Students ask, 'Can I quit here?' They don't seem to realize that they can take a break." ["Did you tell them they could take a break?"] "The AIS instructors checked on many areas; I don't think we've addressed it...They also ask, 'What does this mean?'"

- "We don't use paper with the computers. We printed something once and it used a ream of paper and a cartridge."

- "Student records are too complicated." They do not know how to print what they want, and they do not want the full record, so they keep paper checklists of what has been completed and scores on drills and tests.

- "...Adding modules or courses, sometimes we make mistakes. It's taking more administrator time."

More Comments about PLATO.

"The technology is easy, adding a module is okay. The way [lessons are] broken down is good."

"Students like PLATO. They can get around in the program easily."

"When I talk to the students [I can see that] they understand it."

"The difference with computers is the lack of discussion, time for interaction—like discussing Moby Dick. I like both."

"PLATO is an exciting way to learn. You are competing against yourself and not everybody out there. It is individualized learning."

For the Accelerated Literacy class "we need a program with headphones so that students can be read to." The reading level of PLATO is too high for some students.

Conclusions & Discussion

In the final section of the report, observations of the investigators will be described and discussed.

Student Achievement. As other PLATO studies have demonstrated, Reuther data suggests that the number of modules mastered is positively correlated with posttest scores and—more meaningfully—with size of gain.

The data in this study also indicate that pretest scores were not related to the number of PLATO modules that were mastered. This is a valuable finding, since skeptics may claim that entry skills are a barrier to computer education. This finding should be clarified, however, with an explanation that students with very poor reading skills were put into a separate basic skills program.

The great needs of some students in these programs make these gains even more notable. Computer and mastery test performance must have been affected by personal, social, and academic risk factors of these students. ITED exams were surely affected, since they were administered on set dates.

One surprising finding given the design of the program is that the ratio of modules completed to modules mastered for the test and use group wasn't in the 90% range. This finding may point to a weakness in the implementation of the program. If the program were not being implemented as rigorously as its design required, it might explain why the effect sizes weren't higher that what was observed. If, on the other hand, the program were implemented as intended, then this might indicate a problem in recording and maintaining student PLATO records.

Teacher-directed implementation. Just as Reuther educators dispelled community concerns about PLATO instruction, they demonstrated that computers have not replaced teachers—at least not with these students. Some of the vignettes shared by teachers hint at students who were accustomed to "getting by" in school in whatever ways they could, as well as those who lack understanding of even basic concepts. It may not be possible to build in enough safeguards against students skirting the school program requirements, when students are motivated enough, but this school demonstrates that diligent teachers can assure that students apply themselves with the time that they have. Special needs students require a lot of instructor interaction and attention, not only for tutoring help but also for direction and supervision, and Reuther instructors have been diligent in making students accountable for their work and engaged in it.

Teacher expertise at Reuther also helped in establishing a smoothly-run implementation, monitoring students and applying consequences. They set up good learning and testing conditions by insisting on a quiet room, as well as good lighting and ventilation. They had no trouble with computer tampering due to their careful oversight and the daily assignment of computers. They were able to manage the situation well enough to be able to tutor freely. More importantly, they required attendance in the AIS program and

enforced the policy by calling parents. Student work was monitored for completion, and mastery was required.

Students were given freedom to choose what tasks they did each day—a great decision, given their irregular ability to perform tasks. Learners also chose what books to read, and sometimes what reports to write. There was no matter of choice, however, regarding PLATO modules; students were required to do all parts of them, in order.

Standardized Tests. Reuther's use of standardized tests for pre- and posttesting has been very useful for many purposes. The testing has confirmed student progress for community interests as well as those of the school district; it could also be used to support future funding requests. Teachers use pretest results for student placement and posttest results for confirmation of student gains. The use of the posttest scores for grading may be a solution for other schools to demonstrate student growth, particularly when the program is used more individually than it is at this location.

Addition of teacher-developed content. As in many PLATO sites, even those that use PLATO for exclusive instruction, Reuther teachers added requirements for students to read and produce reports. Such outcomes helped to quell concerns in the community regarding PLATO as a source of instruction, as they have been demonstrations of learning and sometimes problem-solving. Such activities can offer great application experience with skills recently learned, and they can contribute to higher-order thinking as well as memory. However, if PLATO instruction is not closely matched to the assignments, then the two stand apart and do not build on each other. They may both be relevant venues for learning, but there are trade-offs in the use of time. This study did not substantiate any possibilities, but it does pose questions about skills learning.

Technology problems and pitfalls. Reuther's story portrays several problems with technology that have been common elsewhere, including software purchases that exceed hardware capability. However, this site offers a look at the problems of printing student reports and a somewhat unusual way to circumvent them; i.e., drop it altogether. The ease-of-use of their paper setup may never be upstaged by computers; however, the security of the paper data is sometimes in question, and on that score, computers win. This potentially useful tool for student reports has not realized its vision, and it will require more than training to make it do so.

Learning Materials. One of the teachers did know about PLATO paper products, but had a bad experience trying to print some pages from a CD. She felt the selection was difficult, given the small screen representation of pages, and that it was more trouble over all than it was worth. If paper products are useful in some settings, marketing deserves attention.

Staff Development. Teachers praised their PLATO training in interviews and on surveys; they liked the trainer and felt they learned what they needed to know. Nevertheless, teachers had trouble choosing and printing student reports. This seems to be a common

problem with new sites and would be worth more attention, if training time allows it. An analysis of Help Line calls may indicate whether this is important, overall.

About the Authors

Nancy W. Quinn is an evaluator and instructional designer. She received a master's degree in Instructional Science from Brigham Young University in 1991. She recently completed studies of statewide beginning literacy programs in three Midwestern states. She has evaluated the use of technology as a research tool in a research library, as well as the use of technology by fourth, fifth, and sixth graders in a four-year at-school and at-home program.

David W. Quinn is currently working as an independent evaluator specializing in evaluating technology use for learning and teaching. He received a doctorate in educational evaluation from Western Michigan University in 1978. He recently completed ten years at the North Central Regional Educational Laboratory as a Senior Program Associate where he managed the evaluation unit and evaluated technology use in many setting. He has evaluated technology use for the states of Indiana and Virginia, and for school districts in Chicago, Miami-Dade, and Los Angeles County. Before NCREL, Dr. Quinn had conducted numerous evaluation studies for clients in K-12, university, not-for-profit social services, and for-profit training companies. For ten years he was on the faculty in the Department of Instructional Science, Brigham Young University, where he taught graduate research methods courses. He is the author of journal articles and book chapters evaluating technology use in education.

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